

# Development of Collarless Construction Techniques for DD(X)

**Status:** Pending Transition

## PROBLEM / OBJECTIVE

The objective of the program is to develop, identify, and implement collarless construction techniques that will improve the affordability of DD(X) construction, while reducing weight and meeting the Navy's structural requirements for this platform. Collars, which provide load transfer between longitudinal and transverse members, are used extensively during ship construction, and it has been documented that they add significant cost during construction. The use of collarless construction techniques will reduce time and cost during construction, reduce design time, reduce catalog cost, provide savings in weight and materials, and lower residual stress and welding distortion. These techniques will also foster the use of accurate shapes, structures, and assembly methods.

## ACCOMPLISHMENTS / PAYOFF

### *Process Improvement:*

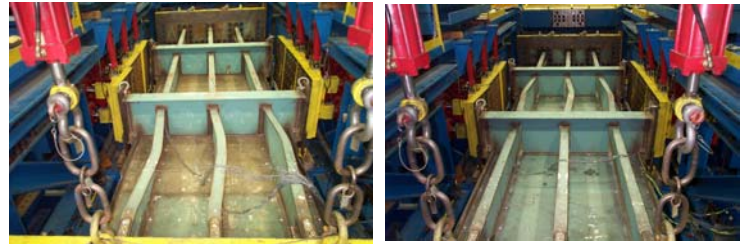
Designs have been developed and are currently being validated that transfer loads between longitudinal and transverse structures with no collars or fewer collars. These designs are being verified for satisfying NAVSEA structural requirements through full-scale structural tests by physical tests and finite element analysis under hydrostatic, longitudinal compression, cyclic, and dynamic loading conditions.

Results indicate that with location specific collar(less) designs, the use of collars may be reduced by up to 50% for DD(X) when compared to legacy designs. These improved designs will provide cost avoidance through reduction of parts and labor and self fixturing ability, while reducing weight of DD(X).

### *Implementation and Technology Transfer:*

An integrated project team has been cultivated that included major participation by the two shipyards that will produce DD(X), Northrop Grumman Ship Systems and Bath Iron Works. Significant input from both shipyards has been incorporated into the design and manufacturing decision related to these techniques, and they have expressed strong interest in implementation.

Navy ManTech Program  
iMAST SS Collarless Construction RevA AUG05



Results of longitudinal compression testing of panels produced using the legacy collar design (left) and the completely collarless design (right).

### *Expected Benefits:*

- Decrease assembly and welding time and effort associated with collars by 20%.
- Avoidance of approximately 10,000 collars for DD(X).
- Cost avoidance of approximately \$750,000 per hull.
- A weight savings of approximately 50,000 pounds per hull.

## TIME LINE / MILESTONE

Start Date: August 1999  
End Date: December 2005

## FUNDING

Total ManTech Investment: \$4.3M  
Cost Share: \$0.7M

## PARTICIPANTS

Penn State ARL (iMAST)  
Northrop Grumman Ship Systems  
General Dynamics Bath Iron Works  
Naval Surface Warfare Center Carderock Division  
Edison Welding Institute (Navy Joining Center)  
Advanced Computation and Engineering Analysis